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(54) A timer controlling system

(57) A timer controlling system for use in connection with electrical appliances, particularly in the entertainment area, providing a time credit keeping means whereby a person with a Master key can allocate a maximum credit time, with or without time boundary constraint in which any user can operate the appliance for a total duration up to the maximum credit time. This maximum credit time is the cumulative amount of time the appliance may be operated any time within the specified time boundary. The Master key serves three purposes. First, it allows any person with the key to access the control settings of the timer controlling system (Programming mode). Second, the same person can override the system while operating the appliance (By-Pass mode). As such, the person is not restricted by the specified time boundary and credit time and the unused credit time is not effected by the operation of the appliance with the Master key inserted. Third, it secures the power socket connecting to the appliance's power cord against tampering.

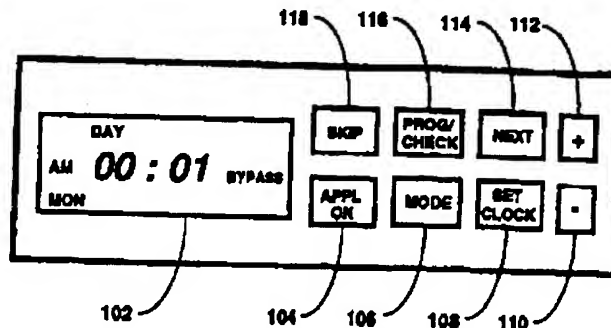


FIG.1

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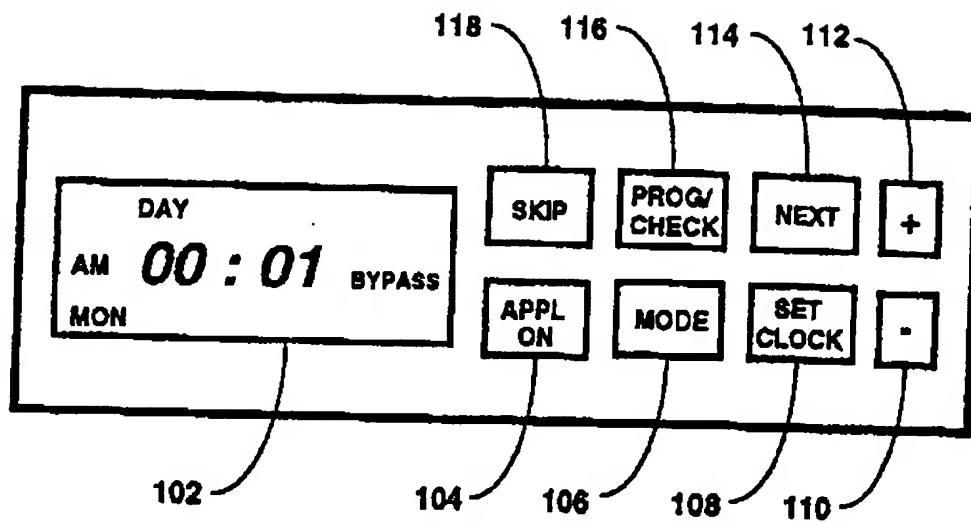


FIG.1

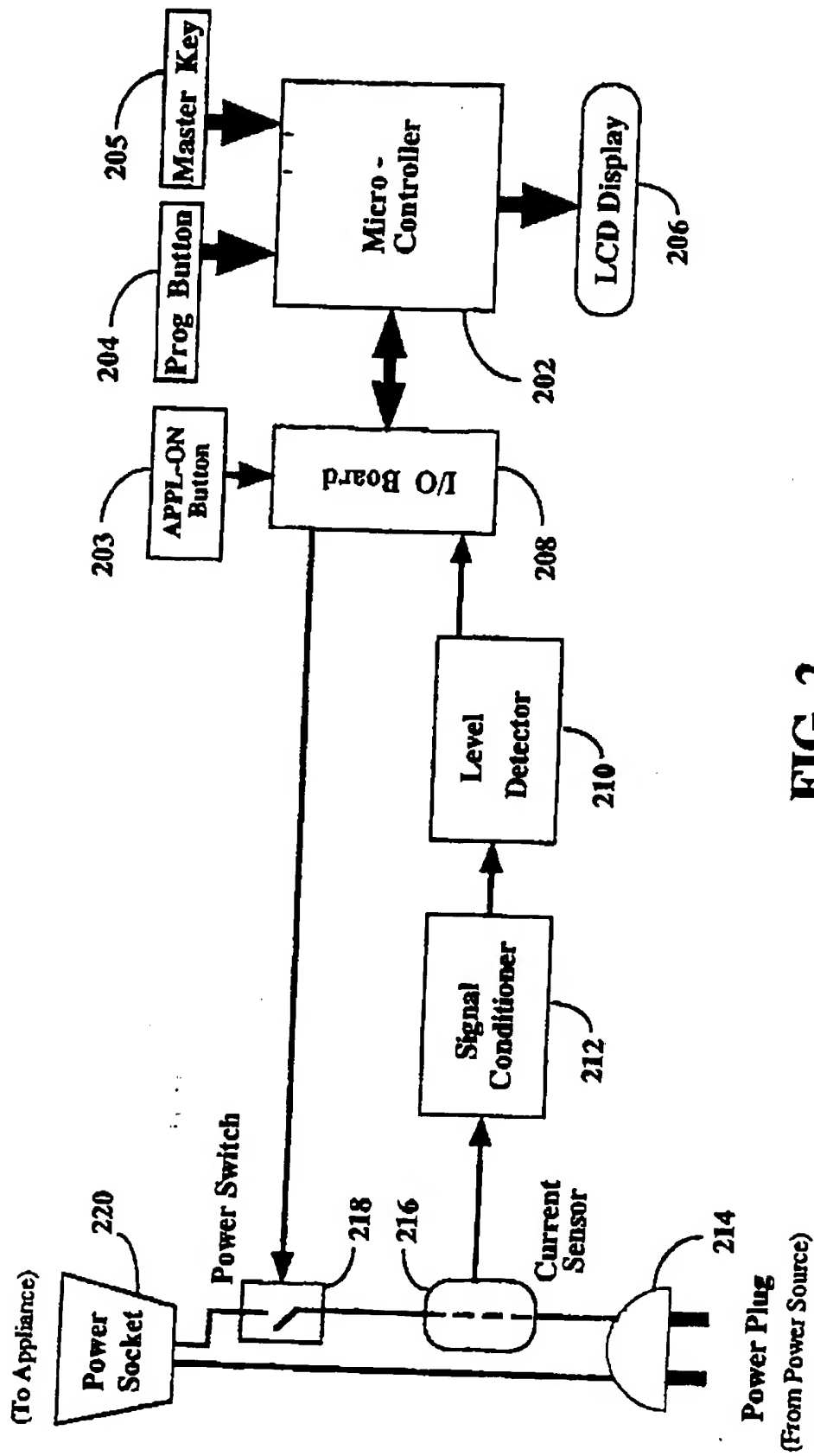


FIG. 2

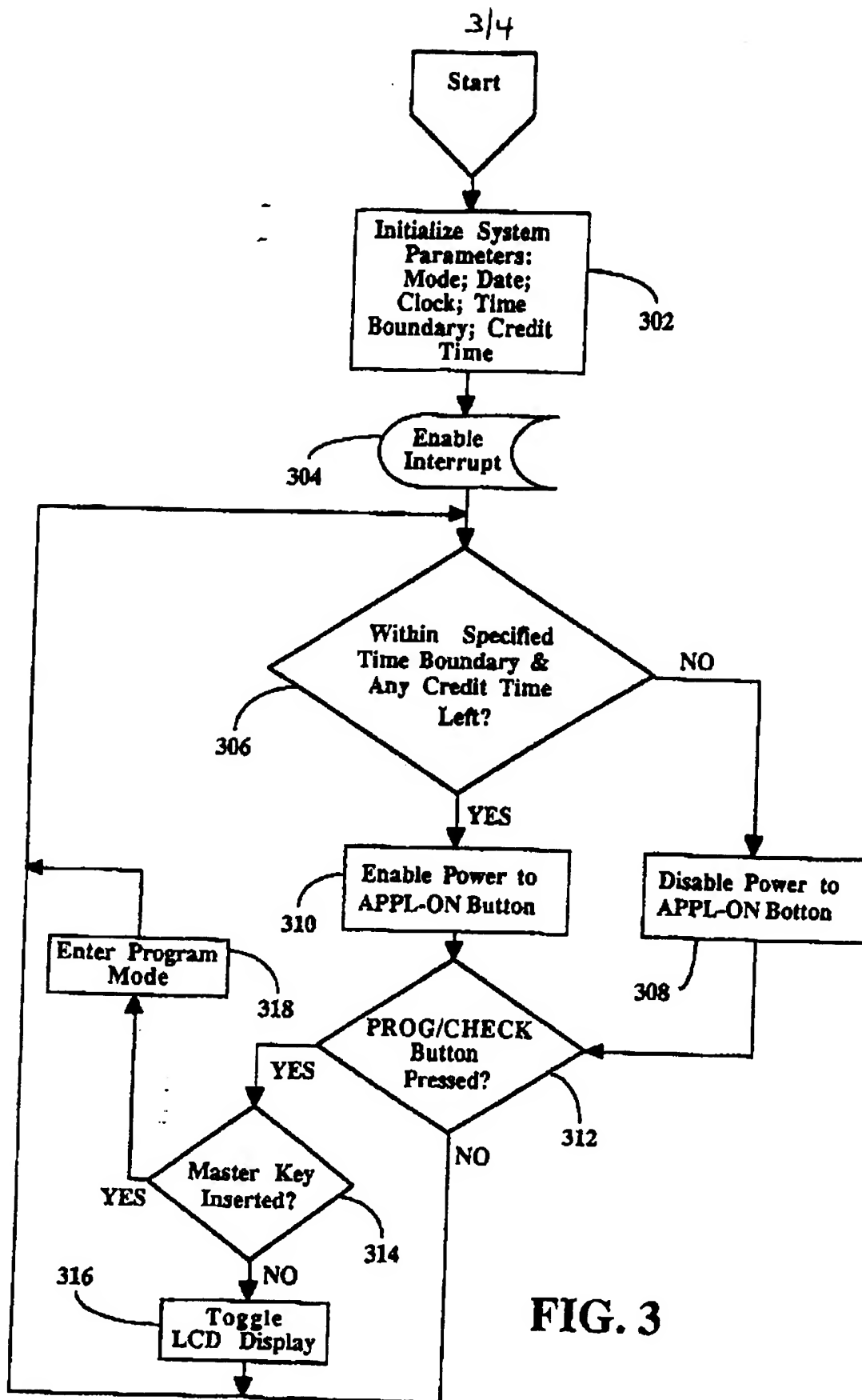


FIG. 3

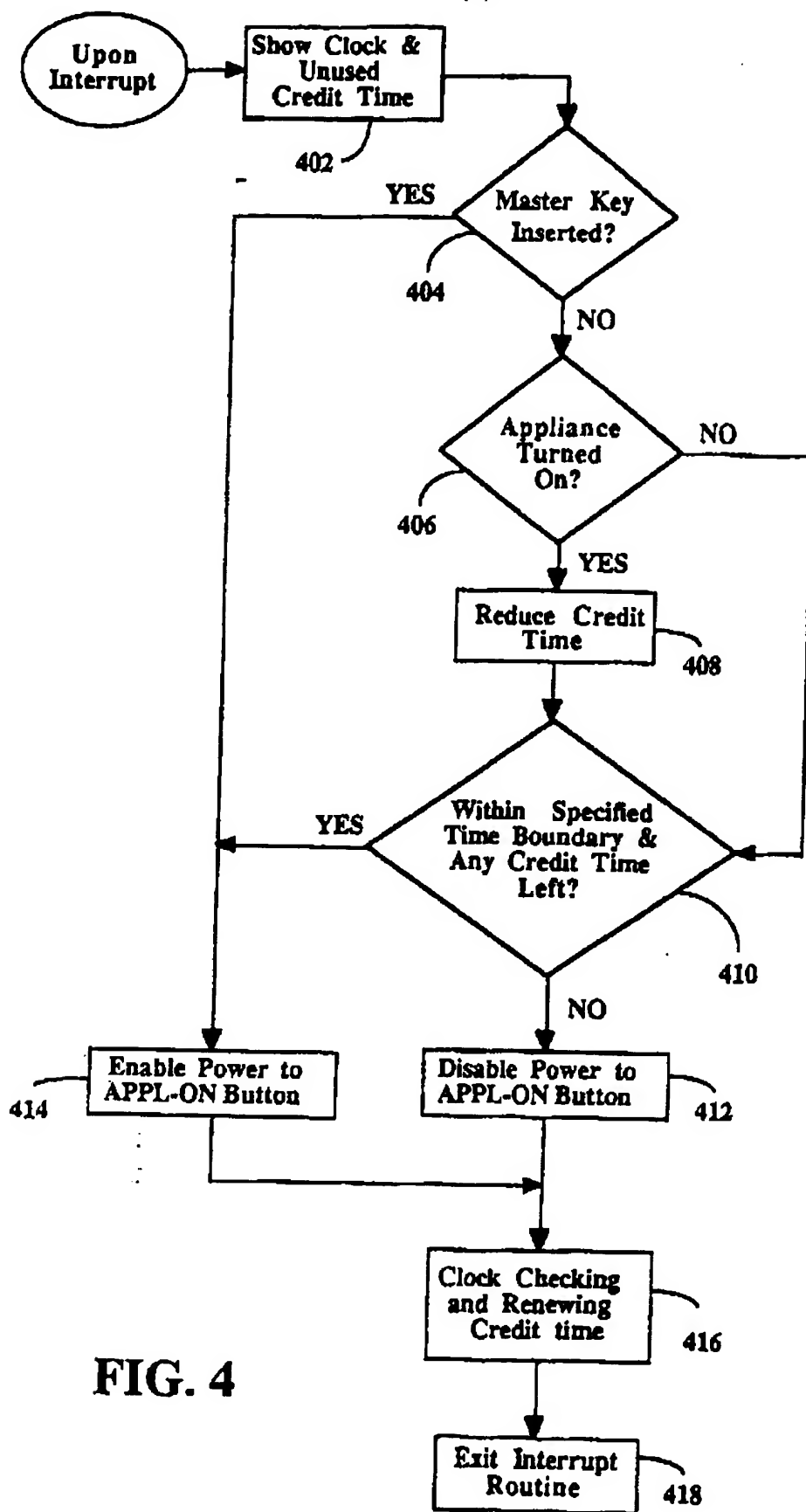


FIG. 4

A TIMER CONTROLLING SYSTEM

The present invention relates to timer controlling devices for electrical appliances for programming pre-selected plurality time periods during which
5 the appliances may be actuated by the user; and more particularly, it relates to time credit keeping devices for machines used in the entertainment area.

10 Electrical appliances are invented to better the standard of living. Many of these inventions are in the area of entertainment. By appliance, the present invention includes but does not exclude television, video game machines, karaoke machines, cable television and so on. However many of these various forms of entertainment do not offer the flexibility to control, for
15 instance, children from watching too much TV or playing too much video games. The reasons for these restrictions are obvious. Another requirement for such control would be Video On Demand whereby a better credit keeping device enables consumers to watch program in piece-meal fashion. Therefore, there is clearly a need to be able to control these appliances so
20 that they could only be used within a certain prescribed periods.

Prior art such as US Pat. 5,191,231 by Berry and US Pat. 4,769, 765 by Green taught a couple of timer controlling systems for controlling the usage of electrical appliances at pre-selected periods. Berry taught a
25 system that can pre-select time periods during which an appliance can be actuated and de-actuated at the selection of a user, or during which time the appliance is not allowed to be operated by cutting off the power supply to the electrical appliance. Green taught a control system similar to that of Berry

but also incorporated a device for authentication of authorized user to access the setting of the pre-selected time periods.

Although above-mentioned methods allow some control over the
5 usage of an electrical appliance, the extent of control is limited and, more
so, lacks flexibility. That is, a user is only allowed to operate that individual
appliance during the specified time periods and no more regardless of
whether the appliance is being operated or not. What is required is a
dynamic time credit system which enables a user to operate an appliance
10 connected to the present invention any time within or outside a specified
time boundary.

It is, therefore, an object of the present invention to provide an improved and more flexible timer controlling system for use in connection with electrical appliances, particularly in the entertainment area by providing a time credit keeping means whereby a person with a Master key can allocate a maximum time credit, with or without time boundary constraint in which any user can operate the appliance connected to the present invention for a total duration up to the maximum credit time. This maximum credit time is the cumulative amount of time the appliances may be operated any time within the specified time boundary. The improvement provided by the present invention includes a Master key which serves three purposes. First, it allows any person with the key to access the control settings of the timer controlling system (Programming mode). Second, the same person can override the present invention while operating the appliance (By-Pass mode). As such, the person is not restricted by the specified time boundary and credit time and the unused credit time is not effected by the operation of the appliance with the Master key inserted. Third, it secures the power socket connecting to the appliance's power cord against tampering.

20

Other objects and advantages of the present invention will become apparent from the following discussion in conjunction with the drawings.

FIG. 1 shows an user-friendly front panel view of the present invention.

5

FIG. 2 shows an overview of the timer controlling system of the present invention.

FIG. 3 shows a flow chart depicting an overview of the micro-code embedded in the Micro-Controller's memory of the present invention.

10

FIG. 4 shows a flow chart depicting the interrupt routine accessed upon an interrupt from within the micro-code as depicted in FIG. 3 of the present invention.

FIG. 1 shows an user-friendly front panel view of the present invention. It consists of a liquid crystal display (LCD) 102 and eight buttons for programming and controlling the timer controlling system. LCD display 102 is the main user interface for displaying information such as credit time left, specified time boundary during which operation of the appliance is permitted, real-time clock (day, time of the day) and mode of operation. The present invention provides two modes of operation; one is based on the Hours-Per-Day and the other is based on the Hours-Per-Week. For the Hours-Per-Day mode, DAY is displayed. This mode limits the total number of hours per day the appliance can be operated according to the daily credit time programmed using the buttons, as will be described below. For instance, if the timer controlling system is programmed such that the Start-After is 9 am and Stop-At is 3 pm and a credit time of two hours on a Monday, then the appliance can only be operated for a total maximum of two hours any time between one second after 9 am and up to 3 pm. Similar constraints could also be programmed throughout the whole week. Any left over credit time can not be carried over to the next day, that is, upon the arrival of a new day a new lot of credit time is re-credited. It is also obvious that the constraints of boundary created by Start-After and Stop-At commands do not need to be activated if the credit time is intended to be used any time throughout the whole day. The Hours-Per-Week mode allows more freedom in that it limits the total number of hours the appliance may be operated for the entire week, from Monday to Sunday. With this mode, the Start-After and Stop-At commands can also be used to impose further restriction on the operation of the electrical appliance. In this mode, the

credit time left will be carried from day to day and will only re-credited upon arrival of a new week. When this mode is in operation, WEEK is displayed.

Referring again to FIG. 1, the programming of the timer controlling systems of the present invention is accomplished by using the LCD display and seven of the eight buttons. The buttons are MODE 106, SET-CLOCK 108, minus (-) 110, plus (+) 112, NEXT 114, PROG/CHECK 116 and SKIP 118. Their functions are as follows:

PROG/CHECK: With the Master key inserted, depressing this button will enable the programming mode whereby system parameters such as the real-time clock, time boundary, credit time and mode of operation may be changed or programmed for the first time. If the Master key was not inserted, pressing this button allows the credit time left and the specified time boundary to be displayed for visual checking upon each depression. This button is used in conjunction with the NEXT, +, - and MODE buttons when Master key is inserted;

MODE: This button sets the mode of operation. It requires the insertion of Master key to function and is used in conjunction with NEXT and SKIP buttons;

NEXT: Used during programming mode; advances to the next field or digit (according to the pre-defined sequence) within an entry when depressed;

+ and -: Used in programming mode for setting the clock (hh:mm), selecting AM or PM, number of hours per day, number of hours per week, Start-After time, Stop-At time and day of the week. The + and - buttons will increase or decrease, respectively, the value every time they are pressed. If the button is held on for more than one second, the value will increase or decrease rapidly according to the button pressed;

SET-CLOCK: To set the time of the day and day of the week for the first time or when required. Used in conjunction with +, - and NEXT buttons. This button is only functional when Master key is inserted; and

SKIP: During programming mode, pressing this button allows the pre-set values to be retained and skips to the next entry in the programming sequence to be changed.

The other button on the front panel next to the above-mentioned buttons is APPL-ON button 104. This button, when pressed, allows current to energize an electronic Power Switch (218 in FIG. 2) so that ac source is connected to the appliance. This button is only functional if there is credit time left and the real-time clock is within the specified time boundary or it is in the By-Pass mode (activated when Master key is inserted). This feature prevents an appliance, such as television, from turning on unexpectedly if its power switch was left in the ON position when the credit time is renewed.

FIG. 2 shows an overview of the timer controlling system of the present invention. It consists of a Micro-Controller 202 which controls the LCD display 206 (102 in FIG. 1) and Power Switch 218 via I/O board 208. Connected to this Micro-Controller are Programming Buttons 204, as described in FIG. 1, Master Key 205 and I/O board 208. The Master Key serves three purposes. First, it allows the user to access the control settings of the present invention (Programming mode). Second, the same user can override the present invention while operating the appliance (By-Pass mode). That is, in this mode, the user can operate the appliance connected to the present invention without being restricted by the specified time boundary and credit time. Furthermore, any unused credit time will not be affected. Third, it secures the power socket connecting to the appliance's

power cord against tampering. The I/O board inputs and receives signals from the Micro-Controller and outputs the signal to enable or disable the Power Switch 218 which connects on one side to a Current Sensor 216 and the other to a Power Socket 220. This signal used to enable or disable the

5 Power Switch is further controlled by APPL-ON button 218 which is also connected to the I/O Board. This button is active only when there is credit time left and the real-time clock is within the specified time boundary or the present invention is in a By-Pass mode. When pressed, it allows current to energize the Power Switch causing the switch to close enabling ac source to

10 be connected to the appliance. This feature is important because, for instance, if a user is watching the television and when the credit time is used up and/or the real-time clock is not outside the specified time boundary or Master key is deactivated, the current to the Power Switch is disabled (without having to press the APPL-ON button), causing the switch to open

15 and hence disconnecting the ac source from the television. If the user forgets to turn the television switch off, the television will be operated when new lot of credit time is recredited or when Master key is inserted. Therefore, APPL-ON button is to prevent the appliance from being operated when not required by user. This button is pressed when operation of the appliance is

20 required. The Current Sensor is connected to a Power Socket 214 for sensing current when appliance is being operated or in standby mode. Hence, it is only active when Power Switch is on. This Current Sensor is a modified Current Transformer capable of detecting low ac current in the magnitude of a few milli-amperes (mA) with power of 1 watt and all the way

25 up to at least 200 watts. This ac current is fed to a Signal Conditioner 212 where it is converted to dc voltage in the order of a few to tens of volts. Within the Signal Conditioner there is also a Voltage Limiter used for protecting the electronic circuit in the case of power surge or spike. The few

volts output from Signal Conditioner is fed to a Level Detector 210. The Level Detector is a voltage comparator comparing the input voltage with a preset threshold voltage level to verify whether it is higher than that level. If the input voltage is lower than the specified threshold voltage level then it means that the electric appliance is either in "standby" mode or not switched on, otherwise, it is in operation. Accordingly when the input voltage is higher than the specified threshold voltage level, it sends a signal to the I/O board 208 which in turn input a signal to the Micro-Controller 202. Programmed within the Micro-Controller's memory is micro-code embedded therein to drive the Micro-Controller. When signal is sent from the I/O board, for instance, in this case a signal indicating the electric appliance is in operation, the Micro-Controller will check to see whether, first of all, By-Pass mode is activated or not. And if it is activated then the electric appliance is enabled to be operated without affecting the time credit stored within the Micro-Controller's memory and also enables the programming buttons. Secondly, if By-Pass mode is not activated, it checks to see whether there is credit time left. If no time credit time is left, the Micro-Controller switches off the power supplying to the electric appliance, otherwise, it continues to enable the operation of the appliance and reducing the time credit until either the appliance is switched off or the time credit is used up or the real-time clock is outside the specified time boundary. The Micro-Controller monitors input and output signals. For instance, when Master key 205 is inserted, it detects the insertion and enables the Programming Buttons and activates the By-Pass mode. Depending on the button pressed, it detects the signal and carries out instructions according to the micro-code (as described in FIGS. 3 and 4 below). While all this is taking place, the Micro-Controller also displays related information on the LCD display for user-friendly communication with the user.

FIG. 3 shows a flow chart depicting an overview of the micro-code embedded in the Micro-Controller's memory of the present invention. Upon starting with the Master key inserted, the timer controlling system goes into initializing mode (block 302) whereby the mode of operation of the invention is selected and accordingly the credit time and time boundary are specified. At this block, the real-time clock including the date and time of the day is also set. The system then enables interrupt to occur at block 304 before proceeding to block 306 where a check is made to see whether the real-time clock is within the specified time boundary and any unused credit time. If it is not within the constraints, power to APPL-ON button is disabled at block 308 before proceeding to block 312, otherwise, power to APPL-ON button is enabled at block 310 before proceeding to block 312. With power to APPL-ON button enabled, pressing this button will enable current to energize the electronic Power Switch (218 in FIG. 2) causing the switch to close and hence connecting ac source to the appliance. At block 312, PROG/CHECK button is checked. If this button is not pressed then it loops back to block 306, otherwise, it further checks to see whether Master key is inserted at block 314. If it is inserted then it enters programming mode (at block 318) whereby the system parameters such as the real-time clock, credit time, time boundary and mode of operation can be changed or set for the first time before looping back to block 306. Otherwise, the LCD display is toggled (at block 316), displaying the credit time left and the time boundary. In other word if the PROG/CHECK button is pressed without Master key inserted, it means that the user wants to find out the credit time left and the specified time boundary. Otherwise, if the Master key is inserted, it means that the user wants to change the system parameters.

FIG. 4 shows a flow chart depicting an interrupt routine accessed upon an interrupt from within the micro-code as depicted in FIG. 3 of the present invention. The flow chart as depicted in FIG. 3 is coded such that an interrupt will occur every 250 milli-seconds. Referring again to FIG. 4, upon an interrupt, it updates the real-time clock and displays this clock and unused credit time on the LCD display alternatively between them every 5 seconds at block 402 before proceeding to block 404. Here, a check is made to see if Master key is inserted. If it is inserted, then, By-Pass mode is enabled and power to APPL-ON also enabled at block 414 before continuing from block 416. Otherwise, it checks (at block 406) to see whether the appliance is turned on. If it is turned on, then, credit time is reduced (because it is not in By-Pass mode) before entering block 410, otherwise, it proceeds straight to block 410 where the real-time clock is checked to see whether it is still within the specified time boundary and whether any credit time left. If the real-time clock is still within the constraints, it proceeds to block 414, otherwise, it disables power to APPL-ON button (at block 412) which will automatically disable current from energizing the Power Switch (218 in FIG. 2) causing the switch to be opened before proceeding to block 416. Here, new day's credit time is renewed if it is midnight and new week's credit time is also renewed if it is Sunday midnight. On completion, it exits the interrupt routine (at block 418) and resumes the interrupted task.

Although the present invention has been described as being used for controlling the usage of electrical appliances in the entertainment area such as television and video games, it should be understood that many changes and modifications may be made by one of ordinary skill in the art without departing from the spirit and scope of the invention.

Claims

1 1. A timer controlling system for providing flexible and improved
2 control over the usage of an electrical appliance, said timer controlling
3 systems comprising:
4 a first switching means connected to a power socket for
5 enabling/disabling power supply to said power socket, said power socket
6 interfaces with said appliance's power cord;
7 a sensing means connected to a power supply line for detecting
8 power consumption of said appliance, said sensing means further
9 connected to said first switching means;
10 a signal conditioner connected to said sensing means for receiving
11 current output therefrom and for converting said current to voltage;
12 a level detector connected to said signal conditioner for receiving
13 voltage output therefrom and for comparing said voltage with a pre-define
14 reference voltage, said level detector outputting a signal when said voltage
15 is substantially higher than said pre-defined voltage;
16 an I/O board connected to said first switching means via a second
17 switching means for sending signals thereto, said I/O board further
18 connected to said level detector for interfacing input and output signals
19 therefrom, said second switching means enabling and disabling said first
20 switching means;
21 a micro-controller connected to said I/O board for monitoring and
22 processing received signals therefrom;
23 a digital programming means connected to said micro-controller for
24 setting system parameters, said system parameters including mode of
25 operation, time boundary, credit time and real-time clock, said mode of

26 operation being either Hours-Per-Day mode or Hours-Per-Week mode, said
27 real-time clock is the day of the week and the time of the day;

28 a security means connected to said micro-controller for enabling and
29 disabling said digital programming means, said security means further
30 enabling the operation of said appliance independent of said time boundary
31 and said credit time and leaving said credit time unaffected, said security
32 means further rendering said power socket interfacing with said appliance's
33 power cord tamper-proof; and

34 a display means connected to said micro-controller for displaying time
35 information and information relating to mode of operation.

1 2. A timer controlling system as claimed in claim 1 wherein said
2 micro-controller is driven by a micro-code embedded in said micro-
3 controller's memory, said micro-code keeping track of said system
4 parameters and manipulating various received signals accordingly.

1 3. A timer controlling system for providing flexible and improved
2 control over the usage of an electrical appliance, said timer controlling
3 systems comprising:

4 a first switching means connected to a power socket for
5 enabling/disabling power supply to said power socket, said power socket
6 interfaces with said appliance's power cord;

7 a sensing means connected to a power supply line for detecting
8 power consumption of said appliance, said sensing means further
9 connected to said first switching means;

10 a signal conditioner connected to said sensing means for receiving
11 current output therefrom and for converting said current to voltage;

12 a level detector connected to said signal conditioner for receiving
13 voltage output therefrom and for comparing said voltage with a pre-define

14 reference voltage, said level detector outputting a signal when said voltage
15 is substantially higher than said pre-defined voltage;

16 an I/O board connected to said first switching means via a second
17 switching means for sending signals thereto, said I/O board further
18 connected to said level detector for interfacing input and output signals
19 therefrom, said second switching means enabling and disabling said first
20 switching means;

21 a micro-controller connected to said I/O board for monitoring and
22 processing signals received therefrom according to a micro-code embedded
23 in said micro-controller's memory;

24 a digital programming means connected to said micro-controller for
25 setting system parameters, said system parameters including mode of
26 operation, time boundary, credit time and real-time clock, said mode of
27 operation being either Hours-Per-Day mode or Hours-Per-Week mode, said
28 real-time clock is the day of the week and the time of the day;

29 a security means connected to said micro-controller for enabling and
30 disabling said digital programming means, said security means further
31 enabling the operation of said appliance independent of said time boundary
32 and said credit time and leaving said credit time unaffected, said security
33 means further rendering said power socket interfacing with said appliance's
34 power cord tamper-proof;

35 a display means connected to said micro-controller for displaying time
36 information and information relating to mode of operation;

37 said micro-code comprising the steps of:

38 (a) establishing said system parameters;

39 (b) enabling real-time interrupt, said interrupt enables
40 access to an interrupt routine,

41 whereby said interrupt routine comprising the steps of:

42 (i) updating said real-time clock and unused said credit time and
43 displaying said real-time clock and unused said credit time;
44 (ii) enabling power to said second switching means if By-Pass
45 mode is activated and continuing step (v) therefrom, said By-
46 Pass mode is activated when said security means is enabled;
47 (iii) reducing credit time if said appliance is turned on;
48 (iv) disabling power to said second switching means if said real-
49 time clock is not within said time boundary and said credit time
50 is fully used up and continuing step (v) therefrom, otherwise
51 enabling power to said second switching means and
52 continuing step (v) therefrom;
53 (v) renewing said credit time when said real-time clock reaching a
54 pre-set time;
55 (vi) exiting interrupt routine;
56 (c) checking whether said real-time clock is within said time
57 boundary and any said credit time left;
58 (d) enabling power to said second switching means if step
59 (c) is satisfied and continuing step (e) therefrom,
60 otherwise, disabling power to said second switching
61 means and continuing step (e) therefrom;
62 (e) checking the status of PROG/CHECK button, repeating
63 from step (c) if said PROG/CHECK button is not pressed,
64 otherwise, checking whether said security means is
65 enabled, said PROG/CHECK button indicating in real-
66 time the user's intention to access programming mode
67 when pressed with said security means enabled, said
68 PROG/CHECK button indicating in real-time the user's
69 intention to check said time boundary and said credit

70 time when pressed with said security means disabled,
71 said programming mode enabling said system
72 parameters to be changed or set;
73 (f) entering said programming mode if said security means
74 - is enabled and repeating from step (c), otherwise,
75 displaying unused said credit time and said time
76 boundary and repeating from step (c).

1 4. A timer controlling system as claimed in claim 3 wherein said
2 first switching means is an electromagnetic switch.

1 5. A timer controlling system as claimed in claim 3 wherein said
2 second switching means is a latch.

1 6. A timer controlling system as claimed in claim 3 wherein said
2 sensing means is a modified current transformer capable of detecting low
3 current in the magnitude of a few milli-amperes with power of one watt and
4 up to at least 200 watts.

1 7. A timer controlling system as claimed in claim 3 wherein said
2 level detector is an electronic comparator.

 8. A timer controlling system substantially as hereinbefore
described with reference to the accompanying drawings.

Relevant Technical Fields

- (i) UK Cl (Ed.M) G4H (HNMC, HTG) G3N (NG1A5, NG1A9)
 (ii) Int Cl (Ed.5) H04N, H01H, G04G

Search Examiner
 M J DAVIS

Date of completion of Search
 5 OCTOBER 1994

Databases (see below)

(i) UK Patent Office collections of GB, EP, WO and US patent specifications.

Documents considered relevant following a search in respect of Claims :-
 1-8

(ii)

Categories of documents

- X: Document indicating lack of novelty or of inventive step. P: Document published on or after the declared priority date but before the filing date of the present application.
 Y: Document indicating lack of inventive step if combined with one or more other documents of the same category. E: Patent document published on or after, but with priority date earlier than, the filing date of the present application.
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Category	Identity of document and relevant passages	Relevant to claim(s)
X	US 5231310 (OH) whole document	1-8

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